

Digital Image Processing

Homework Assignment #2

Due: 9:10am, 11/4, 2022

1. Suppose that a digital image is subjected to histogram equalization. Show that a second pass of histogram equalization (on the histogram-equalized image) will produce exactly the same result as the first pass.
2. An image is filtered four times using a Gaussian kernel of size 3×3 with a standard deviation of 1.0. Because of the associative property of convolution, we know that equivalent results can be obtained using a single Gaussian kernel formed by convolving the individual kernels.
 - (a)* What is the size of the single Gaussian kernel?
 - (b) What is its standard deviation?

3. Repeat Example 4.1 in the textbook (page 211) but using the following function:

$f(t) = A$ for $0 \leq t < T$ and $f(t) = 0$ for all other values of t . Explain the reason for any differences between your results and the results in the example.

4. Write a program for histogram equalization, and test it with your own selfie took in a relatively dark environment so that we can clearly see the effect of histogram equalization in image enhancement. Please show the histograms of your selfie before and after histogram equalization and explain your results. (Note: You only have to work on the gray-scale image.)

Language for Implementation

- C++ or Python (If you want to use other languages, please contact TAs. We need to make sure we can run your program!)
- OpenCV is a useful open library for image processing, and you can use the function in OpenCV directly.

Submission

- Please submit a .zip/.rar file to [NTU COOL](#), containing
 - Project (source code and execution file)
 - Report (.pdf file)
- Late submission:
 - within 24 hours after its due will incur 20% penalty,
 - after 24 hours and within seven days of its due will incur 50% penalty, and
 - after seven days of its due will not be graded.

Note: One minute late is the same as 23 hours late.

DO NOT COPY OTHER'S HOMEWORK!!